Small Submersible Robust Microflow Cytometer for Quantitative Detection of Phytoplankton, Phase II

Completed Technology Project (2011 - 2014)

Project Introduction

Marine phytoplankton are critical in sustaining life on Earth. They are key drivers of the global biogeochemical cycles of carbon and other nutrients, and account for 50% of global photosynthesis. Phytoplankton growth is the fundamental component of the 'ocean biological pump' ⬭ one of the two primary mechanisms that cause the ocean to be a significant sink of atmospheric carbon dioxide. Since different taxa occupy different ecological niches, identifying the major influences on the spatial and temporal distribution of phytoplankton groups is necessary to understand ecosystem function and the role of the oceans in global climate. Scientists employ various satellite sensors to measure the amount and distribution of chlorophyll a, an indicator of phytoplankton biomass in the ocean, but satellites only detect near-surface properties and therefore cannot adequately resolve the water column biomass and composition of phytoplankton species. Small and robust sea-based instrumentation (the innovation of this work) provides this information, as well as valuable independent verification of the spaced-based data ("sea truth" data). The objective of this program is to develop a small, inexpensive, submersible, robust microflow cytometer (uFC) for quantitative detection of phytoplankton, to be initially deployed on the NSF Center for Coastal Margin Observation & Prediction coastal ocean observatories (Oregon). The device will be designed for long-endurance autonomous operation. The proposed design has low power requirements, reduces or eliminates consumables, prevents of fouling, and reduces sensitivity to the environment. Our Phase 2 technical objectives are to (1) fabricate a complete uFC with all the subsystems necessary for extended autonomous operational deployment; (2) test our uFC on a coastal station operated by CMOP/OHSU. (3) Deploy our mFC on a submarine glider operated by CMOP/OHSU (4) Collect data at-sea, along the coast of Oregon/Washington.

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Small Business Innovation Research/Small Business Tech Transfer

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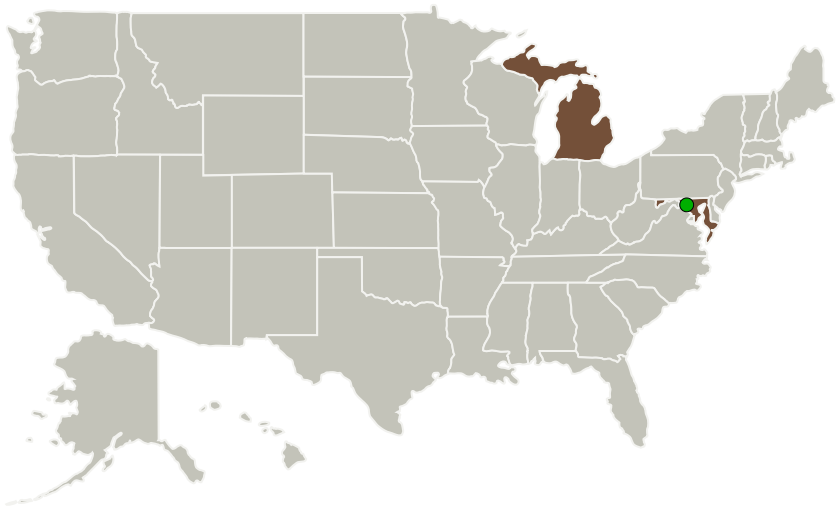
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Translume, Inc.	Lead Organization	Industry	Ann Arbor, Michigan
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Michigan

Project Transitions

June 2011: Project Start

August 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139343)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Translume, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

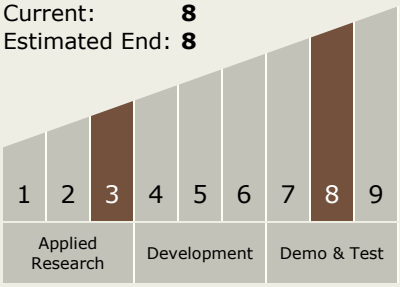
Carlos Torrez

Principal Investigator:

Philippe Bado

Technology Maturity (TRL)

Start: **3**
Current: **8**
Estimated End: **8**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System